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(54) Part-face heading machine

The described method serves the purpose of avoiding overloading in the removal system of a part-face heading machine with motor-driven loading tools. According to this method, the loading [states] in the removal system, for example a belt-type conveyor or a chain-type conveyor (8), are continuously acquired with methods utilizing measuring technology, and the measured signals are supplied to an evaluation unit (11). Upon reaching a specified limit value of the loading, via a regulating valve (14), controlled by the evaluation unit (11), the loading capacity of the loading tools (8) is temporarily throttled. As a consequence hereof, the loading in the removal system will decrease. Upon reaching a specified lower limit value of the loading, the speed of the loading tools (8), and therewith their loading capacity, is again brought back to the original nominal value.

Specification

The invention relates to a method for avoiding overloading in the removal system of a part-face heading machine with motor-driven loading tools.

In the known part-face heading machines of this type the excavated material accumulating at the face end is, as a rule, supplied by loading tools operating at a specifiable nominal power to a succeeding continuous conveyor, such as for example a belt-type conveyor or a chain-type conveyor. Primarily depending on the lumpiness of the accumulating excavated material, the specified nominal load-carrying capacity of the continuous conveyor may temporarily be exceeded during the operation. In such cases, an overload protection device on the driving side of the continuous conveyor responds and switches off the driving motor. This leads to troublesome operation interruptions with standdown times, which, to some extent, are considerable, since before [the conveyor] is switched on again, the cause of the overloading must first be eliminated.

DE 26 39 590 C3 discloses a coal cutting machine in a constructional implementation like a part-face heading machine, in which the loading boom is driven from the front deflection wheel of a chain conveyor. At low constructional height, such as can be required for employment in mining practice, there is the risk that relatively large excavated material lumps become jammed during the transit from the loading ramp to the chain conveyor. In order to avoid in such cases damage to the driving means, the driving motor is connected via a slip coupling with the chain conveyor. The slipping moment of the slip coupling is set to be higher than the tilting moment of the driving squirrel cage induction motor. Therefore, upon the response of the slip coupling,

the driving motor is also switched off through the higher current consumption. Consequently with this protection device undesirable standdowns of the part-face heading machine as a consequence of loading peaks cannot be avoided. The invention offers here a remedy.

The invention accordingly has as its aim to prevent through a suitable method the occurrence of overloading in the removal system of a part-face heading machine, such that undesirable switch-offs cannot occur in the first place.

This aim is attained according to the invention through a method, in which the loading [states] of the continuous conveyor in the removal system are continuously acquired with methods of measuring technology and the measurement signals are supplied to an evaluation unit, in which, upon reaching a specified limit value of the loading, via a regulating valve controlled by the evaluation unit, the loading capacity of the loading tools is temporarily throttled and, after reaching a specified lower limit value of the loading of the continuous conveyor, is brought back again to the original nominal value.

Advantageous further embodiments of the method are described in the dependent claims. For example, in case an electromotor is utilized as the driving means for the continuous conveyor, Suitable operating parameters such as current, voltage, rotational speed or others are advantageously acquired with a measurement value sensor as measurement signals.

In the case of a hydraulic motor as the driving means for the continuous conveyor, with a sensor advantageously fluid pressure, rotational speed, torque or other measurement signals are acquired.

Instead of monitoring the driving motor, it can also be advantageous to acquire with a sensor the mechanical loading of the continuous conveyor, for example the tension of the conveyor belt or of the conveyor chain.

According to another advantageous further development, depending on

the type of driving means of the loading tools, their driving motor is controlled or regulated with the aid of the regulating valve either electrically, hydraulically, mechanically, pneumatically or of a combination of the listed options.

The invention is based on the concept of continuous monitoring of the loading in the removal system, which, as a rule, comprises a continuous conveyor. For example, in the event of imminent overloading, the loading power of the loading tools can be throttled through a regulation measure and therewith an overloading of the driving motor of the continuous conveyor can be prevented. Hereby, as a significant advantage of the invention, the continuous operating mode of the part-face heading machine can be attained within specifiable limit values. Thereby that undesirable standdowns can virtually no longer occur, overall a better capacity utilization of the part-face heading machine is possible. Mechanical overloading at the active parts of the conveyor device are also prevented. Entailed therein is an extension of the intervals between maintenance and a corresponding increase of the service life of the active parts of the conveyor.

In the following the invention will be explained in further detail in conjunction with an embodiment example depicted in the drawing. The sole Figure shows schematically a top view onto a part-face heading machine.

The depicted part-face heading machine is comprised of a machine body (1), mounted on a crawler vehicle (2). Apart from the functional sites required for the operation of the machine, the machine body (1) is comprised of an operating console. On the front side of the machine body is supported a cutting jib (3), which is pivotable about a vertical and a horizontal axis and at its front end bears a rotatable jib cutting head (4).

Beneath the cutting jib (3) extends a loading ramp (5) connected with the machine body. For transferring the accumulating excavated material on the loading ramp (5) two rotating loading tools (6) are provided, which are driven by

a hydraulic motor (7).

Adjoining the loading ramp (5) is a chain conveyor (8) extending in the longitudinal direction of the machine, which conveyor projects in the rearward direction with respect to the machine body (1). The chain conveyor (8) is driven by two electromotors (9), which are connected in terms of gearing on opposite sides of the chain conveyor (8) with the shaft of the rearward deflection wheel.

The device for avoiding overloading of the chain conveyor (8) comprises essentially the following elements. In the depicted embodiment example two types of continuous acquisition of the loading of the chain conveyor (8) are indicated. In one embodiment, a suitable operating parameter of one of the two electromotors (9) is measured with a sensor (10). This measured value is supplied to an evaluation unit (11) known per se.

According to a second embodiment the mechanical loading of the chain conveyor (8) is acquired with a suitable sensor (12) and its measurement signals are supplied to the above cited evaluation unit (11). In practice, as a rule only the one or the other embodiment will be employed for acquiring the measurement values.

The change of the loading capacity of the loading tools (6) takes place by changing their speed of rotation. For this purpose in the compression means supply line (13) for the driving motors (7) a suitable regulating valve (14) is disposed, with which the throughflow quantity of the pressure means can be varied. The regulating valve (14) is controlled by the evaluation unit (11). Upon reaching a specified limit value of the loading of the chain conveyor (8), the regulating valve (14) is so regulated by the evaluation unit (11) that the speed of rotation of the driving motors (7) of the loading tools (6) is temporarily reduced. As a consequence hereof, the loading of the chain conveyor (8) decreases. Upon reaching a lower limit value, the rotational speed of the driving motors (7) is again brought back to the specified nominal value.

Patent Claims

1. Method for avoiding overloading in the removal system of a part-face heading machine with motor-driven loading tools for transferring the excavated material to a continuous conveyor, such as for example a belt conveyor or a chain conveyor, and with an overloading protection device for driving the continuous conveyor, **characterized in** that the loading [states] of the continuous conveyor (8) are continuously acquired with methods of measurement technology, and the measured signals are supplied to an evaluation unit (11), that, upon reaching a specified upper limit value of the loading, via a regulating valve (14) controlled by the evaluation unit (11) the loading capacity of the loading tools (6) is temporarily throttled and that, upon reaching a specified lower limit value of the loading of the continuous conveyor (8), it is brought back to the original nominal value.

2. Method as claimed in claim 1, characterized in that in the case of an electromotor (9) for driving the continuous conveyor (8) with a sensor (10) suitable operating parameters, such as current, voltage, speed of rotations or others are acquired as measuring signals.

3. Method as claimed in claim 1, characterized in that, in the case a hydraulic motor is utilized for driving the continuous conveyor, suitable operating parameters such as fluid pressure, speed of rotation, torque or others are acquired as measurement signals with a sensor.

4. Method as claimed in claim 1, characterized in that the mechanical loading of the continuous conveyor (8), for example the tension of the conveyor belt or of the conveyor chain, is measured with a suitable sensor (12).

5. Method as claimed in one of claims 1 to 4, characterized in that depending on the type of driving of the loading tools (6), their driving motor is controlled or regulated with the aid of the regulating valve either electrically, hydraulically, mechanically, pneumatically or of a combination of the listed options.

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1 sheet of drawing enclosed
